Attaining Good Water Quality through California's Clean Beach Initiative: An Assessment of Seventeen Projects

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SUMMARY

To date, about $74 million have been granted, through the State of California's Clean Beach Initiative (CBI), to municipalities and other agencies for source studies and construction projects to improve water quality at beaches. Projects consisted of one or more best management practices (BMPs) designed to reduce loads of fecal indicator bacteria (FIB) entering beach waters, thus meeting State standards for bathing waters. An important part of this process was to evaluate how successful these projects were in reducing bacteria along the beaches. Key assessment questions are:

- Was the technology employed successful in reducing bacteria?
- Were shoreline densities reduced after the project was implemented?
- If the project was not successful, did the problem lie with the technology employed, or were other, uncontrolled sources of bacteria impacting beach waters?

Lessons learned from these projects would be applied to future ones, especially on the soundness of technology strategies, and the ability to control various sources of FIB, such as from contaminated runoff or feces from wildlife.

Seventeen of the initial CBI funded projects were assessed for this project. Projects generally were categorized as follows: Low-flow Diversions, Sterilization Facilities, Sewer Improvements, Pier BMPs, Vegetative Swales, and Enclosed Beach BMPs. The general assessment strategy employed was to test for changes in pre- and post project mean densities of FIB at shoreline monitoring stations along beaches targeted by the projects. Projects were designed mainly to operate only during dry-weather since rain events typically overwhelm these facilities. Therefore, rain days were excluded from the analyses by removing the day of rain plus two additional days to allow from drainage from the watershed. A scoring system based on pre- and post-project exceedances of State bathing water standards along with changes in mean FIB densities was used to judge the effectiveness of each project.

The projects treated runoff volumes ranging from 1.14-189.3 m^3/d (301-50,000 gal/d), averaging 770.2 ± 928.2 m^3/d (203,412 ± 245,151 gal/d) over the dry season (April through October). The most successful projects included the low-flow diversions conveying runoff into the sanitary sewer systems. The most successful diversions at Santa Monica and Temescal Canyons removed nearly all runoff from the beach, while least successful projects (e.g. Imperial and Coronado Beach) were at beaches where runoff and other sources of FIB continued to impact the beach waters. Sterilization facilities had a wide range of effectiveness. The most successful facility was at Moonlight Beach where filtration combined with UV sterilization killed >99% of the FIB in treated runoff, and the relatively short distance to the beach (250 m) in a channel with no beach ponding limited recontamination and regrowth of FIB. The Aliso Beach UV project also had a high reduction of bacteria (>96%), but the long distance to the beach of 10,200 m resulted in FIB quickly reaching levels exceeding bathing water standards before reaching the beach. The Poche installation had less successful bacterial reduction since pre-filtration was not performed, and collection of treated effluent in a beach pond resulted in recontamination of the water and adjacent surf zone. The Pacifica wetland

swale project was successful since all runoff was soaked into the ground. Mixed BMPs at the enclosed Baby Beach, Dana Point Harbor, lowered bacterial densities, likely reflecting the positive impact of the low-flow diversion that removed runoff from the beach. Least effective were the pier BMPs and sewer improvements. Despite reducing FIB from these projects, the target beaches still were impacted by other sources of bacteria.

The most effective technologies were those that removed all contaminated runoff from a beach, like many of the diversions and the wetland swale project. The UV sterilization facility also was effective, provided that sterilization was preceded with filtration, and that the treated effluent was released within a few hundred meters of the beach. Other BMPs assessed in this report were less effective because they either did not effectively reduce FIB densities, they only treated a portion of contaminates sources impacting their target beach, or both. Lessons learned from this assessment should be incorporated into future CBI projects.